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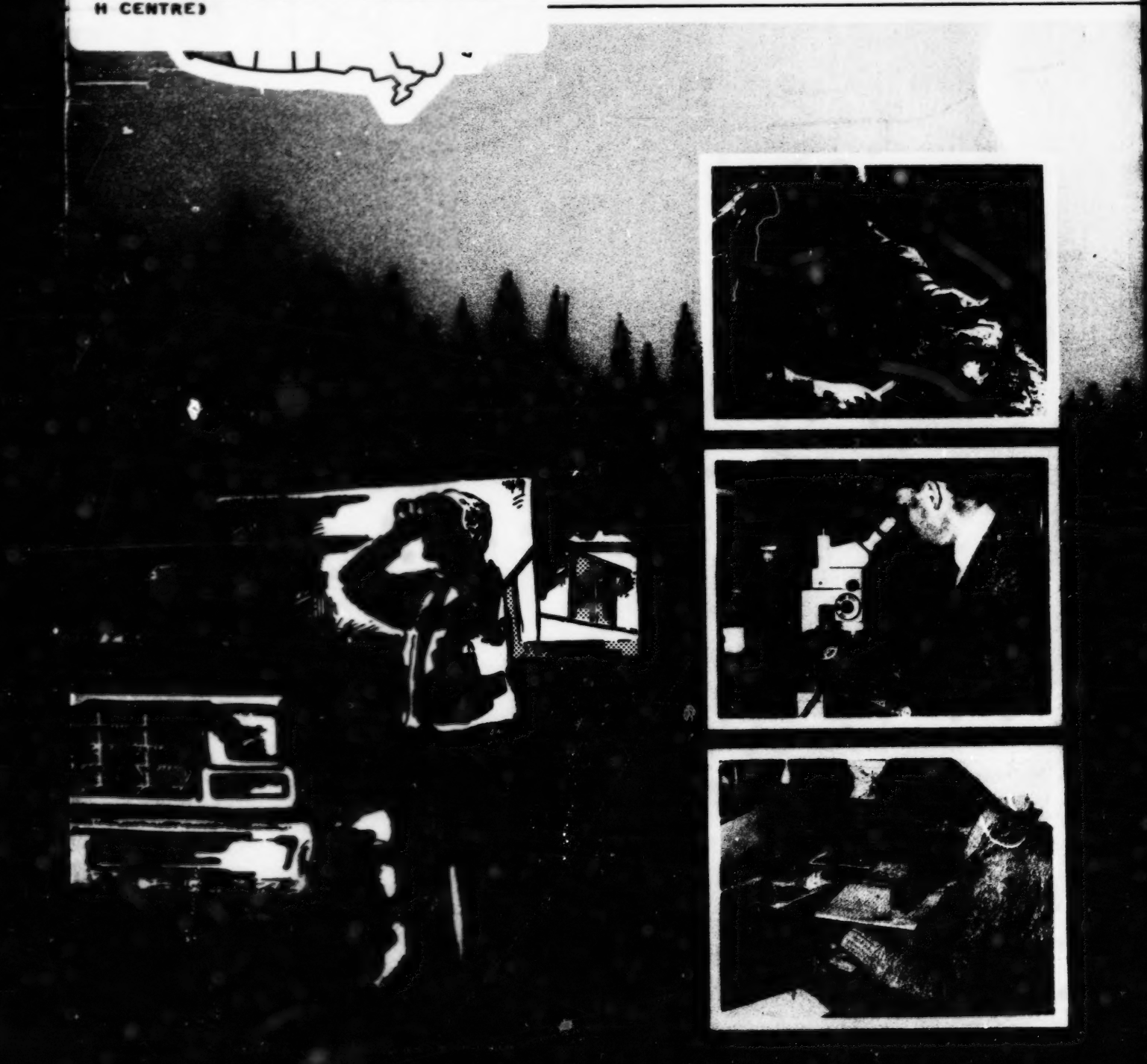
Forest insect and disease conditions

British Columbia & Yukon 1983

C.S. Wood, G.A. Van Sickle and T.L. Shore

Information Report BC-X-246
Pacific Forest Research Centre



FOREST INSECT AND DISEASE CONDITIONS

BRITISH COLUMBIA AND YUKON

1983

C.S. Wood
G.A. Van Sickle
and
T.L. Shore

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ABSTRACT

This summary of forest pest conditions in British Columbia and the Yukon in 1983 was compiled from records and field reports of 11 Forest Insect and Disease Survey technicians. Emphasis is on damaging pests that are, or may become, major management problems.

RÉSUMÉ

Ce sommaire relatif a l'état des ravageurs forestiers en Colombie-Britannique et au Yukon en 1983 fut catalogué à partir des archives et des rapports sur les travaux effectués dans le champ par 11 techniciens des insectes et maladies des arbres. L'accent est mis sur les ravageurs qui sont ou pourraient devenir de sérieux problèmes de gestion.

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INTRODUCTION

The six Forest Insect and Disease Survey units of the Canadian Forestry Service are responsible for producing a national overview of important pest conditions and their implications; maintaining records and surveys to support quarantines, supporting forestry research through maintenance of records, herbaria, and insect collections; and providing advisory services concerning forest insect and disease conditions. General surveys to detect and monitor important insects and diseases are conducted annually in the Pacific Region with the cooperation of the British Columbia Ministry of Forests and other federal, provincial, industrial, and municipal agencies. The close cooperation with research programs and staff at the Pacific Forest Research Centre continues to be an important contribution.

This regional report reviews the impact and status of major forest insects and diseases throughout British Columbia and the Yukon Territory in 1983 and forecasts some pest conditions for 1984. The information is compiled primarily from the observations and field records of eleven Forest Insect and Disease Survey Rangers during their field assignments extending from late May to October. More detailed information for each provincial forest region is available in file reports compiled by the following rangers.

Cariboo Forest Region
- Dick Andrews

Kamloops Forest Region
- Bob Erickson; Bob Ferris

Nelson Forest Region
- Peter Koot; Rod Turnquist

Prince George Forest Region
- Rod Garbutt; Jim Loranger

Prince Rupert Forest Region
- Leo Unger; Nick Humphreys

Vancouver Forest Region
- Roly Wood; John Vallentgoed

Other staff of the Forest Insect and Disease Survey project in 1983 were as follows:

- Bob Duncan, Insectary Technician
- David Evans, Entomologist i/c Insectary and Collection
- John Hopkins, Pathologist i/c Herbarium
- Daphyne Lowe, Herbarium Technician
- Erika Pass, Insectary Technician
- Terry Shore, Pest Survey Sampling Officer
- Walter Stanek, Mensuration
- Joan Strobbe, Secretary
- Allan Van Sickle, Head of the Forest Insect and Disease Survey Unit
- Colin Wood, Chief FIDS Ranger

SUMMARY

Mountain pine beetle continued to be the most significant insect problem of mature forests in British Columbia. Most infestations continued to expand and intensify. Throughout the province, 43.7 million trees were killed over 462 150 ha mainly in the Cariboo Region.

There was a decline in area of mature spruce killed by **spruce beetle** to 58 600 ha from 99 000 ha in 1982, more than 3.3 million m^3 were affected. The decline was mainly in the Prince George Region due to host depletion; there was little change in the Prince Rupert Region.

The area of Douglas-fir forest defoliated by **western spruce budworm** increased nearly fourfold to 73 550 ha of mostly light intensity in the Kamloops and Cariboo regions and a localized area in the Nelson Region. Defoliation did not occur in Vancouver Region for the second year following more than a decade of infestation.

In the third year of outbreak, **Douglas-fir tussock moth** lightly to severely defoliated 21 000 ha of Douglas-fir stands in the Thompson — Okanagan area of the Kamloops Region, almost double the area affected in 1982. An additional 4 725 ha severely defoliated in 1981 and 1982 contained mostly dead or dying trees. Localized infestations continued over 175 ha south of Clinton in the Cariboo Region, on 2 275 ha near Rock Creek in the Nelson Region, and 25 ha near Chilliwack in the Vancouver Region. A naturally occurring nuclear polyhedrosis virus severely affected pre-adult populations and significantly reduced the number of egg masses and 1984 populations in most areas. Severely defoliated mature Douglas-fir near Ashcroft, Falkland, and Christina Lake were recently attacked by **Douglas-fir bark beetle**.

In the Prince Rupert Region **spruce budworm** populations increased and lightly to moderately defoliated current and older foliage of alpine fir — spruce stands over 153 000 ha, up from 90 000 ha in 1982. A **one-year cycle form** has increased significantly since first reported in 1981, and is now active in about half the infested area.

A nuclear polyhedrosis virus severely affected **western false hemlock looper** larval populations in the Salmon Arm — Shuswap area in the Kamloops Region where only 250 ha were affected in the third year of outbreak, down from 1 150 in 1982.

Light to severe defoliation of western hemlock and western red cedar by **western hemlock looper** between Mica and Lower Arrow Lake in the Nelson Region and in new outbreaks in the Kamloops and Prince George regions increased almost sixfold to 37 250 ha. High populations should continue in 1984.

Thorough followup inspections for **terminal crook disease** of western hemlock seedlings at four sites planted in 1981 west of Parksville on Vancouver Island were negative. The seedlings had been associated with infected nursery stock, which was subsequently destroyed.

Western larch in the East Kootenay was severely defoliated by **larch sawfly** in more than 70 areas totalling 10 400 ha in the second year of outbreak. Fall population assessments indicate a decline in 1984. New outbreaks of **larch budmoth** defoliated 36 widely scattered stands in the Nelson Region. **Larch casebearer** populations increased significantly in the East Kootenay affecting 60 000 ha. However, in the West Kootenay casebearer populations declined, attributed in part to parasites released periodically since 1969. Parasite releases continued in 1983 as part of a biological control program.

Black army cutworm severely damaged or killed an estimated 200 000 newly planted seedlings in about 35 sites in the Prince Rupert and Prince George Regions, seriously affecting planting schedules. A naturally occurring virus affected 85% of the larvae in two infested plantations.

In most age classes of pine, spruce, and Douglas-fir a high incidence of **root rots, dwarf mistletoes, stem diseases** and **terminal weevils** continued to cause tree mortality and growth loss in Coastal and Interior forests seriously affecting management programs.

Severe infection of one-year-old lodgepole, white and ponderosa pine needles by several **needle cast diseases** induced by optimum weather conditions in 1982, resulted in widespread premature needle drop in the Cariboo, Kamloops, Nelson, and Prince George regions.

The status of current and potentially damaging forest pests was assessed in 34 forestry-related Employment Bridging Assistance Programs (EBAP) and in 44 not sufficiently restocked (NSR) sites.

For the first time on Vancouver Island, **gypsy moths** were recovered from pheromone traps. Nine males were collected in the Courtenay area by Agriculture Canada. A cooperative Agriculture Canada/Canadian Forestry Service egg mass survey in the area was conducted in November; no egg masses were found. Three egg masses were found in Langley on the Lower Mainland where 26 males were collected in 18 traps.

Aerial surveys of 1983 forest pest outbreaks were reduced to 135 hours, down 50% from 1982, because of budget constraints. However, limited coverage of most major outbreaks in the Kamloops and Nelson regions and parts of the Prince George, Cariboo and Vancouver regions, was completed. Extensive coverage of the Cariboo and parts of the Prince Rupert regions by B.C. Ministry of Forests was completed with data transferred to the Forest Insect and Disease Survey.

PINE PESTS

MOUNTAIN PINE BEETLE
Dendroctonus ponderosae

Mortality of lodgepole pine and some western white pine killed by the 1982 beetle attack covered an estimated 462 150 ha, from the International border in the East Kootenay to north of Smithers (See Map, Page 10). More than 6 440 infestations contained an estimated 43.7 million trees (17.8 million m^3) killed by the beetle last year (Table 1). The greatest losses continued, as in 1982, in the Cariboo, Kamloops, and Nelson regions with significant mortality in the Prince Rupert, Prince George and Vancouver regions. Based on an average 27% current attack in 22 areas in three regions, tree mortality in 1984 is expected to continue to increase and outbreaks expand in the Cariboo, Kamloops, and Prince Rupert regions. In the Nelson Region infestations will continue to decline due to host depletion and in the Prince George and Vancouver regions localized infestations will persist.

The largest area of pine mortality, 382 000 ha, was in the Cariboo Region which contained 35 million recently killed trees, a considerable increase from 1982.

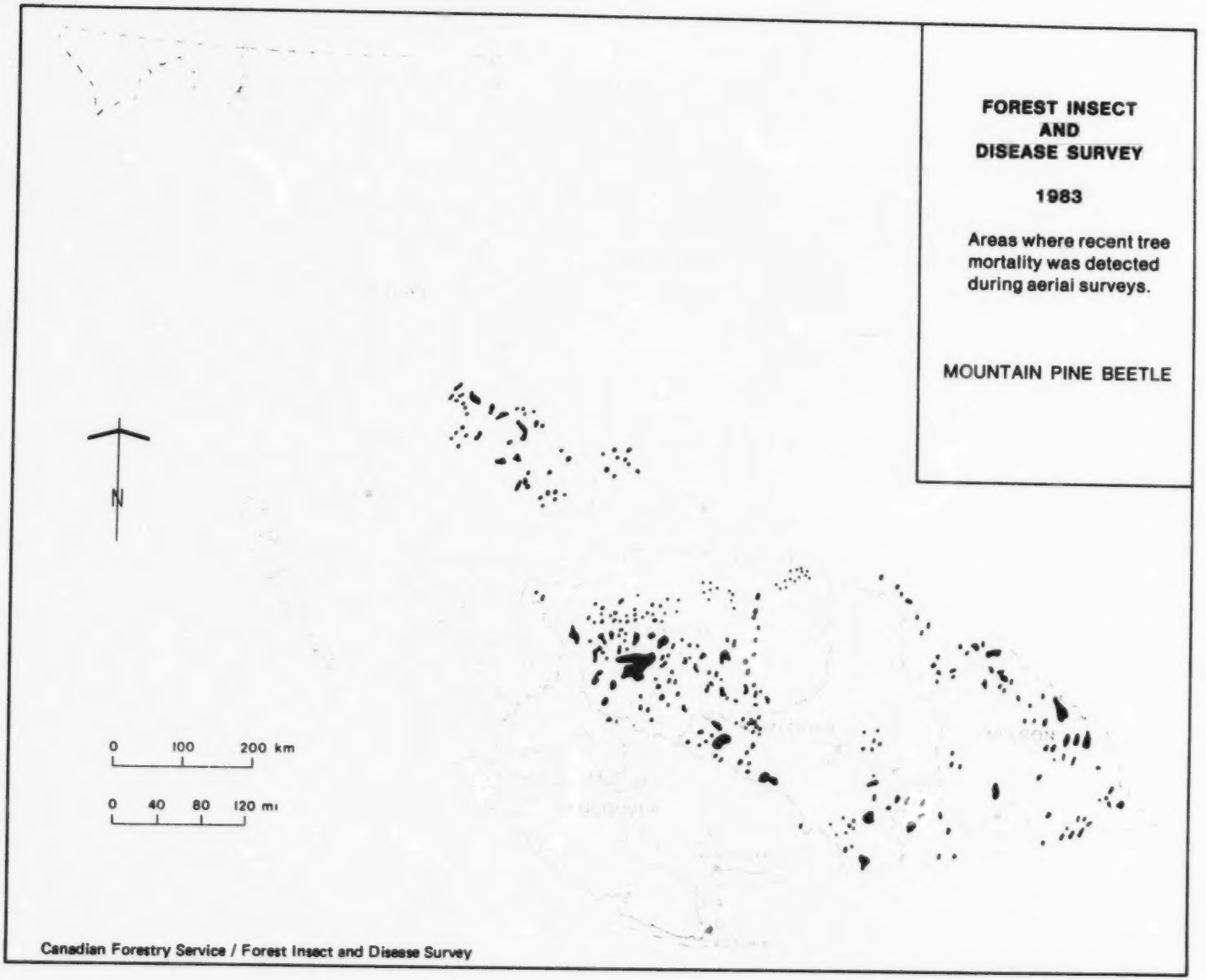
TABLE 1. Number and area of mountain pine beetle infestations by provincial Forest Region, based on recently killed trees observed during aerial surveys and on limited ground observations, British Columbia, 1983.

Region	No. of Infestations	Area (ha)	Trees Attacked in 1982		No. of Stands Cruised	Average % of Trees[b]				
			Number[a] (000)	Volume (000 m^3)		H	C	R	G	P
Cariboo	3 500 +	382 000[c]	35 000	12 500	14	54	32	6	3	5
Kamloops	535	44 000	5 700	3 775	4	50	18	9	13	10
Nelson	1 700	20 000	2 050	710	6	65	7	10	12	6
Prince George	90	750	18	10	-	-	-	-	-	-
Prince Rupert	600	13 300[c]	961	770	4	30	31	28	10	4
Vancouver	15	2 100	7	-	-	-	-	-	-	-
TOTAL	6 440+	462 150	43 736	17 765	28	50	22	13	8	6

[a] Trees attacked in 1982, discolored in 1983

[b] H = Healthy; C = Current, attacked in 1983; R = Red, attacked in 1982; G = Grey, attacked prior to 1982, P = Partial attack (strip attack).

[c] Estimated with data contributed by B.C. Ministry of Forests, Cariboo and Prince Rupert regions.


FOREST INSECT
AND
DISEASE SURVEY
1983
Areas where recent tree mortality was detected during aerial surveys.
MOUNTAIN PINE BEETLE
N
0 100 200 km
0 40 80 120 mi
Canadian Forestry Service / Forest Insect and Disease Survey

The increase in infested area was due mainly to the expansion of widespread infestations from Alexis Lake west to Anahim; however, part of this increase may be attributable to the variation among the increased number of people contributing to the sketch mapping in 1983. The average current attack in 14 stands representative of recently attacked areas, was 32% of the stems per hectare which indicates that a high level of tree mortality can be expected again in 1984.

An estimated 5.7 million lodgepole pine were killed in the Kamloops Region in 535 infestations over 44 000 ha. Outbreaks expanded near Gold Bridge, Carpenter Lake, Tyaughton, and French Bar creeks and east of Kelowna. Major infestations continued in the Stein River Valley near Lytton and in Trout, Hayes, Summers, Shorts, and Lambly creeks in the Okanagan Valley, and in the Ashnola River Valley. Assessments of current attacks in representative stands indicated continued outbreaks in 1984 and increased mortality in the Gold Bridge area.

Infestations in the Nelson Region declined by nearly half for the second year to an estimated 2 million lodgepole pine and some white pine killed in 1 700 infestations over 20 000 ha. The major decline, a result of host depletion from beetle attack and harvesting since 1977, occurred in the Flathead River Valley. Infestations persisted elsewhere in the Region including the Ward-Gilnockie creeks area, along the British Columbia-Alberta border in the White and Kootenay river drainages, Kootenay National Park, the Golden-McNaughton Lake areas and in the Kettle River Valley in the West Kootenay. Current attack in four representative stands was 7%, similar to 1982, which indicates continuing but declining outbreaks and tree mortality in 1984.

In the Prince Rupert Region, 961 000 lodgepole pine (769 000 m^3) were killed over 13 300 ha, a threefold increase in the number and volume of pine killed and double the area infested in 1982. Major infestations continued in Harold Price Creek and the Fulton and Morrison lakes area, and expanded in the Babine Lake area and in the Cranberry and Nass River drainages south of Vandyke. Infestations declined due to host depletion in the Kispiox, Suskwa, and Skeena river drainages. Current attack in six representative areas including Harold Price Creek and the Kispiox River Valley averaged 28% (range 17-36%), down from 35% in 1982. This indicates continuing outbreaks in 1984, particularly in the Babine and Fulton lakes areas where the number of currently attacked trees equalled the number of all previously killed trees.

Outbreaks in western white pine over 550 ha along Canoe Arm south of Valemount contained the majority of the recently killed trees in the Prince George Region. North of Fort St. James, lodgepole pine mortality totalled 2 620 trees over 200 ha, a decrease from 1982.

The number of lodgepole pine killed in the Van[illegible]ver Region increased to 7 000 in 15 infestations over 2 100 ha mainly in the Homathko, Bella Coola, and Klinaklini River drainages west of major outbreaks in the Chilcotin. Other infested stands were widely scattered, mainly in the Pemberton area and near Boston Bar. Efforts to control a small infestation near the east gate area of Manning Park continue to be encouraging. Only 36 currently infested trees, 10 baited with pheromone attractant were marked for a fall and burn control program, down from 252 in 1982. However, the number of recently attacked trees, in groups of 5-15, increased in stands east of the park to Princeton, a potential threat to large areas of susceptible lodgepole pine.

NEEDLE DISEASES

Conspicuous, severe discoloration of 1982 lodgepole pine, white pine and ponderosa pine needles by native needle diseases was widespread in the Cariboo, Prince George, and Nelson regions and to a lesser degree and extent in the Kamloops Region.

Red band needle disease, *Dothistroma pini*, was the most common, and was often associated with other pine needle blights such as *Lophodermella concolor* and *L. montivaga*. Elytroderma needle disease, *Elytroderma deformans*, was very common on mature ponderosa pine and a pine needle blight, *Leptomelanconium cinereum*, affected localized areas.

In the Cariboo Region infection of lodgepole pine stands by *L. concolor* and *D. pini* increased from light patchy occurrences in 1981 and 1982 to widespread severe infection in 1983 from Clinton to Williams Lake west to Chilanko Falls and in the eastern part of the Region. Less severely infected stands extended over widespread areas elsewhere in the region.

Both *L. concolor* and *D. pini* severely infected immature lodgepole pine stands in the eastern and southern areas of the Prince George Region. About 70% of the 1982 needles on most of the trees were affected over 10 000 ha in the Holmes River Valley. Lightly infected stands were common between Strathnaver and Prince George and in the Chief and Nukko lakes areas north of Prince George.

White pine were severely affected by *D. pini* for the second year in the Nakusp-Summit Lake-Hills areas, where an average of 60% of the previous years needles on all the trees was affected. Less severely diseased stands were common in the Ymir and Salmo areas.

Light to severe infections affected up to 50% of lodgepole pine stands over widespread areas from Rock Creek to Castlegar; in the Slocan Valley; near Salmo, from Elko to Cranbrook; in the Canal Flats and Fairmont areas, and in the Kootenay, White, and Bull River drainages.

Light to severe infection of 1982 ponderosa pine needles of all age classes by Elytroderma needle disease was widespread in the Kamloops Region and parts of the Nelson Region. Systemic infections have resulted in severe brooming. In the Kamloops Region infection ranged from 10% in localized areas to 90% on half of the trees in stands of 50 ha and more in the Campbell and Heffley creeks areas and near Savona and Oliver. Localized 5-ha stands on Anarchist Mountain and west of Osoyoos were similarly infected. Half of the ponderosa pine in the Rock Creek area in the Nelson Region were severely broomed and about 30% of the 1982 needles on nearly half of 30 ha of lodgepole pine stands near Fairmont and in the Moyie River and Plumbob Mountain area were infected.

The current needles on most of the lodgepole pine in a plantation near Hendrix Lake in the Cariboo Region were severely infected by a disease *Phaeoseptoria contortae*. This was the first collection of the pathogen in British Columbia since first identified on lodgepole pine in southwestern Alberta in 1970.

A needle blight, *Leptomelanconium cinereum*, infected up to 80% of the previous year's needles of ponderosa pine in numerous pockets of more than 50 ha in the Kookanusa Lake area in the East Kootenay. Repeated infestations since 1979 in some areas have resulted in severe needle loss.

RED TURPENTINE BEETLE
Dendroctonus valens

The beetle which usually attacks weakened and predisposed pine was evident in increased numbers in mature ponderosa pine weakened by at least two successive years of severe defoliation by Douglas-fir tussock moth in the Kamloops Region. The attacked trees were recorded in predominantly Douglas-fir stands at Oregon Jack Creek and near Falkland.

PINE WOOD NEMATODE
Bursaphelenchus lignicolus

Results of surveys to determine the presence of a wilt disease of pines caused by the nematode were negative. Recently discovered in Manitoba and the United States, it has been responsible for mortality of pines over large areas in Japan during the past 30 years. Although the pine wood nematode survey was negative, a nematode, *Aphelenchoides* sp. native to North America, was successfully isolated from a western gall rust *Endocronartium harknessii* infected lodgepole pine near Chilliwack in the Vancouver Region.

SPRUCE PESTS

SPRUCE BEETLE
Dendroctonus rufipennis

The area of mature white and Engelmann spruce killed by 1981-1982 beetle attacks covered about 58 600 ha (See Map, Page 14) mostly in the Prince George and Prince Rupert regions, with localized infestations in the Cariboo, Nelson, and Kamloops regions (Table 2). The decline, from 99 000 ha in 1982, was due in part to harvesting and improved monitoring programs in previously chronic infestation areas, and also to host depletion.

Nearly half of the current year's mortality of trees in the Prince George Region was in the upper McGregor River drainage. The incidence of current attack was 68% in Haggen Creek, in the Bowron River drainage. Elsewhere, current attack averaged 24% but the high

TABLE 2. Number and area of spruce beetle infestations by provincial Forest Region based on 1981- and 1982-killed trees observed during aerial surveys and limited ground observations, British Columbia, 1983.

Region	No. of Infestations	Area (ha)	Volume killed (000 m³)	No. of Stands Cruised	Average % of Trees[a]				
					H	C	R	G	P
Cariboo	8	4 100	419	-	-	-	-	-	-
Kamloops	4	300	-	-	-	-	-	-	-
Nelson	60	2 700	51	3	83	3	2	10	2
Prince George	600	35 000	1 700	3	33	24	16	24	3
Prince Rupert	-	16 500[b]	1 100	12	38	13	25	17	7
TOTAL	672	58 600	3 270	18	51	13	14	17	4

[a] H = Healthy; C = Current, attacked in 1983; R = Red, attacked in 1981-82; G = Grey, attacked prior to 1981; P = Partial attack (strip attack).

[b] Estimated by B.C. Ministry of Forests, Prince Rupert Region.

numbers of healthy broods in 1982-attacked trees indicate continuing tree mortality in 1984.

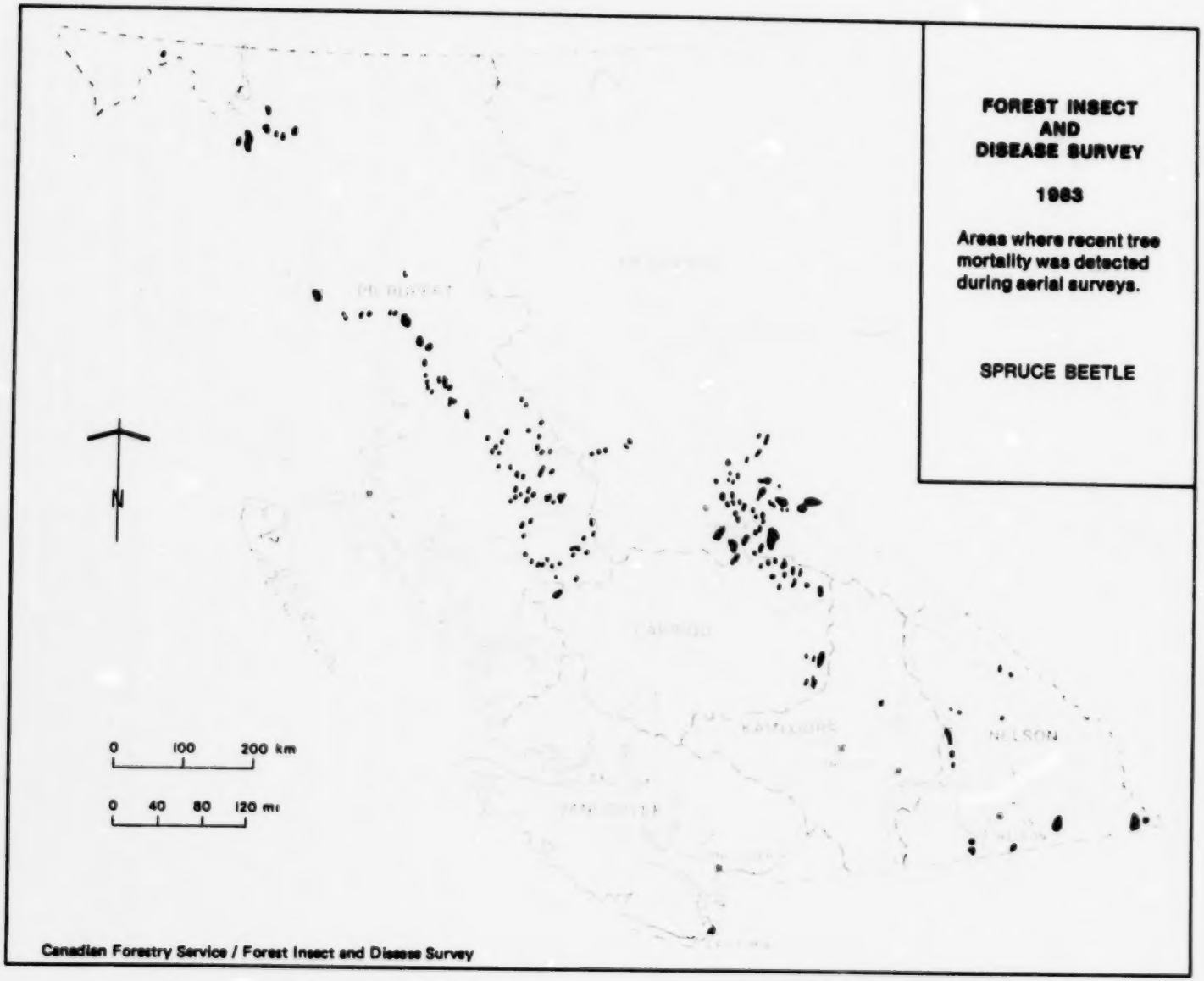
In the Prince Rupert Region, the infestations were estimated to cover 16 500 ha, similar to that infested in 1982. Major infestations persist throughout much of the southern part of the region including the Tetachuck-Eutsuk lakes area and the Morice, Fulton, and Bell-Irving drainages. An isolated 300-ha infestation in the Taku River drainage south of Atlin near the Alaskan border has declined probably because of host depletion; however, infested pockets likely remain. Although current attack in 12 stands declined to an average of 13% in the 'non-flight' year from 33% in 1982, populations are expected to continue at outbreak levels in 1984. Increased tree mortality in 1984 is indicated by the high numbers of two-year-cycle broods in 1982-attacked trees.

Mortality of mature spruce continued between Km 70 and Km 83 along the Haines Road between the Yukon and Alaska border in the Prince Rupert Region. Following a population buildup in trees predisposed by injury or stress resulting from a road improvement project started in 1979, an estimated 300 spruce were recently attacked and killed by the beetle. Trees containing broods were marked by FIDS for removal by Public Works Canada to reduce the populations and the potential hazard to extensive adjacent stands.

The area of spruce infested by the beetle in the Cariboo Region declined for the second consecutive year by more than half, to 4 100 ha with 419 000 m³ killed. Infestations were mainly in the Bowron, Big Valley, and Cottonwood River drainages, including Bowron Lakes Provincial Park. Observations of broods in 1982 attacked trees in parts of the region indicate significant tree mortality in 1984.

Infestations in 60 areas in the Nelson Region also declined by more than half to 2 700 ha due mainly to harvesting and improved monitoring and direct control. The largest, at Pingston Creek near Revelstoke, declined to 1 170 ha from 3 500 ha in 1982. Localized infestations developed in the upper Duncan River drainage and adjacent Glacier National Park and continued in Cabin Creek in the Flathead and in the Creston area. Only 3% of the trees were currently attacked in three representative infestations, healthy broods in less than 10% of the previously attacked trees indicate the current decline will likely continue.

The numbers of recently-killed spruce in the Kamloops Region remained at low levels in localized areas in the Blue River, Salmon Arm, Lillooet, and Princeton areas.


FOREST INSECT
AND
DISEASE SURVEY
1983
Areas where recent tree mortality was detected during aerial surveys.
SPRUCE BEETLE
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0 100 200 km
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Canadian Forestry Service / Forest Insect and Disease Survey

SPRUCE WEEVIL
Pissodes strobi

Mortality of current year leaders in 10 to 20-year-old Sitka spruce averaged 30% in six plantations in the Prince Rupert Region and 15% in seven plantations on Vancouver Island.

Current attack ranged from 5% to 90% in sites in the Kitimat, Terrace and Greenville areas in the Prince Rupert Region. At Andesite Creek near Kitimat, leader mortality was 5%, down from 18% in 1982. A native predator, *Lonchaea* sp., was ten times more numerous than weevil larvae.

In seven sites on Vancouver Island the highest incidence of leader mortality (34%) was in a Norway spruce plantation in the Tsolum River Valley northwest of Courtenay, and in a Sitka spruce provenance trial in the Sayward Forest (33%).

SPRUCE APHID
Elatobium abietinum

Increased aphid populations lightly to moderately defoliated Sitka spruce on the north and east coasts, and up to 10 km inland, on the Queen Charlotte Islands in the Prince Rupert Region. Populations remained low in the mainland coastal areas including Prince Rupert. Following six years of moderate to severe defoliation, 20% of the mature (60 cm dbh) spruce in a 100-tree study area have been killed compared to 7% in 1982.

DOUGLAS-FIR PESTS

WESTERN SPRUCE BUDWORM
Choristoneura occidentalis

Infestations in Douglas-fir forests in parts of the Cariboo, Kamloops, and Nelson regions (See Map, Page 16) expanded nearly fourfold to 73 550 ha from 17 000 ha in 1982.

The most extensive outbreak area was over 54 750 ha in the Kamloops Region where mostly light to moderate defoliation continued in the Cache Creek — Ashcroft area, with a significant increase in the Savona — Kamloops Lake area.

In the Clinton area of the Cariboo Region, the outbreak increased to 18 500 ha consisting of mainly light defoliation over 10 500 ha, and moderate and severe defoliation over 8 000 ha.

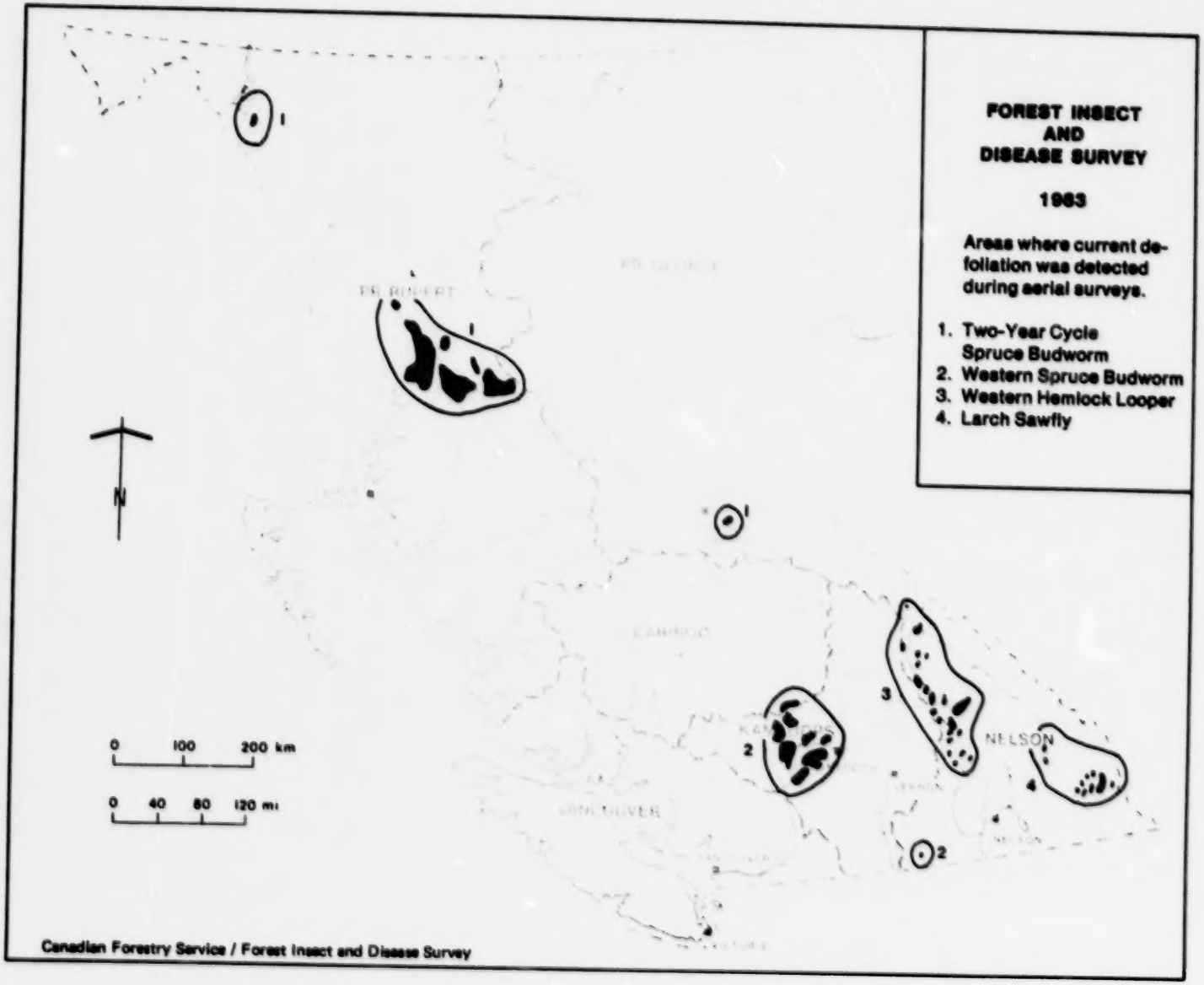
Bud, branch, and leader mortality is evident on up to 50% of the understory trees which have been severely defoliated for two or more years from Pimainus Ridge near Spences Bridge to north of the Cariboo Region boundary.

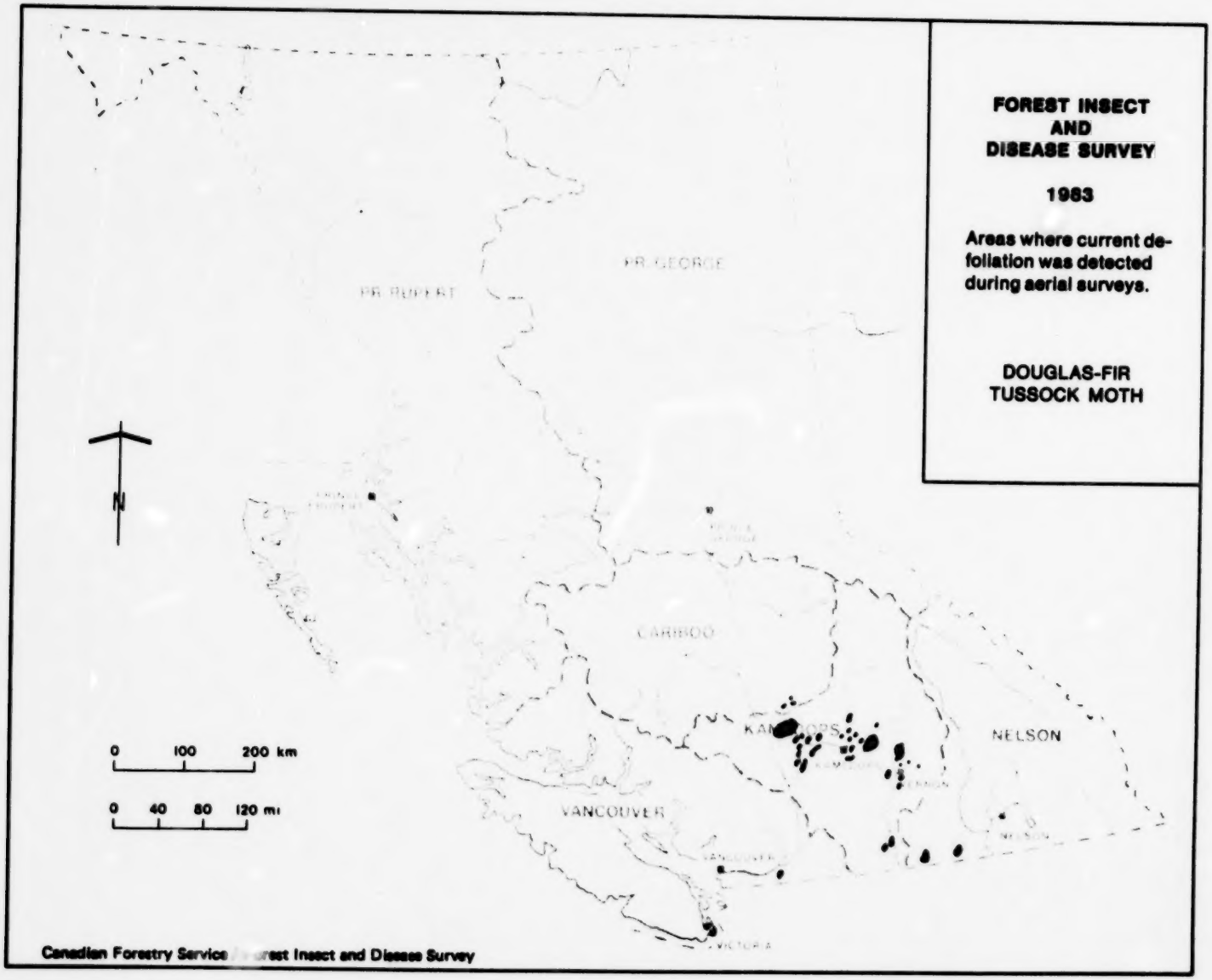
Trace defoliation occurred over 300 ha in the Rock Creek area in the Nelson Region where populations have persisted for eight years.

Populations and defoliation are likely to continue in 1984, based on the increased number of larvae in beating samples, the numbers of adults caught in pheromone traps, and the increased egg counts in the 26 defoliated stands examined in the Cariboo and Kamloops regions. Severe defoliation is expected in the Cache Creek and Clinton areas with moderate defoliation near Ashcroft, Savona, Loon Lake and light west of Lillooet. Defoliation is not expected to occur in the Vancouver Region.

DOUGLAS-FIR TUSSOCK MOTH
Orgyia pseudotsugata

About 23 475 ha of mature and immature Douglas-fir forest in the province were defoliated by the tussock moth in 1983 (See Map, Page 17), nearly double the area affected in 1982. Light to severe defoliation in the


FORESTINSECT
AND
DISEASE SURVEY
1983
Areas where current defoliation was detected during aerial surveys.
1. Two-Year Cycle Spruce Budworm
2. Western Spruce Budworm
3. Western Hemlock Looper
4. Larch Sawfly
N
0 100 200 km
0 40 80 120 mi
PR. RUPERT
PR. GEORGE
CARIBOO
VANCOUVER
NELSON
1
2
3
4
Canadian Forestry Service / Forest Insect and Disease Survey


FORT NELSON
PRINCE GEORGE
PRINCE RUPERT
CARIBOO
KAMLOOPS
NELSON
VANCOUVER
VICTORIA
N
0 100 200 km
0 40 80 120 mi
FOREST INSECT AND DISEASE SURVEY
1983
Areas where current defoliation was detected during aerial surveys.
DOUGLAS-FIR TUSSOCK MOTH
Canadian Forestry Service / Forest Insect and Disease Survey

third consecutive year of the outbreak occurred mainly in the Kamloops (21 000 ha), Nelson (2 275 ha), and Cariboo (175 ha) regions with localized pockets in the Vancouver Region (25 ha). Previously defoliated areas with a significant amount of tree mortality, totalled 4 725 ha mainly around Pritchard, Armstrong, and Mt. Swanson areas in the Kamloops Region.

The major expansion occurred around the 1- and 2-year-old outbreaks in the Kamloops Region, and new infestations developed between Spences Bridge and Ashcroft, near Pavilion in the North Thompson River Valley, west of Kamloops to Savona, near Westwold, and between Vernon and Lumby.

A major decline is forecast in 1984 as egg masses were found only in 10 of the 40 stands sampled, significantly fewer than in 1982 (Table 3). Even the highest count of 1.5 masses per tree at Cherry Creek between Kamloops and Savona indicates only moderate defoliation. Surveys using pheromone-baited traps also indicate that the outbreak has peaked and should decline with only scattered pockets of light feeding forecast for 1984. The average number of moths in traps in the Okanagan-Similkameen averaged 15 compared to 68 in the Thompson River area and 19 at Rock Creek in the Nelson Region.

The population decline is attributed to a high incidence

TABLE 3. Douglas-fir tussock moth egg mass surveys and predicted defoliation for 1984.

Location (by Forest Region)	No. of Stands Sampled		No. of Egg Masses per Tree[a]		Predicted Defoliation[b]
	Pos	Neg	Average	Range	1984
Kamloops					
North Thompson Valley	1	4	0.1	0-10	T
Kamloops	1	1	0.1	0-6	T
Savona	1	0	0.04	0-3	N
Cherry Creek	1	0	1.5	0-108	L-M
Cache Creek	1	5	0.02	0-2	N
Ashcroft	4	3	0.1	0.04-0.3	T
Spences Bridge	0	1	0	0	N
Chase	0	2	0	0	N
Falkland	0	1	0	0	N
Vernon	0	3	0	0	N
Kelowna	0	2	0	0	N
Olalla	1	1	0.2	-	T
Cariboo					
Clinton area	0	3	0	0	N
Nelson					
Rock Creek	0	3	0	0	N
Vancouver					
Chilliwack	0	1	0	0	N

[a] 20 to 70 trees examined per location.

[b] Egg masses per tree and potential defoliation.

less than 0.1	= N	none
0.1 to 0.7	= T	trace, patchy
0.8 to 2.0	= L,M	light to moderate
2.1 or more	= S	severe

of naturally occurring biological control factors. A nuclear polyhedrosis virus, identified by microscopic examinations at PFRC, affected 58% of 388 larval samples collected from 42 locations in the Thompson — Okanagan area by B.C. Ministry of Forests personnel. In addition, parasites occurred in 58% of the cocoons from eight locations between Spences Bridge and Cache Creek.

Trees are expected to recover in most moderately defoliated stands; however, tree mortality or dieback could occur where trees were severely defoliated for two or more years. Trees with a dbh of 20 cm or larger in severely defoliated stands are particularly susceptible to attack by Douglas-fir beetle, *Dendroctonus pseudotsugae*. About 40% of the mature trees (range 30 to 80%) were recently attacked in localized areas including Oregon Jack Creek, Bonaparte Indian Reserve, Deadman and Campbell creeks and in the Pritchard and Falkland areas. Douglas-fir beetle also occurred in a few trees previously defoliated by the tussock moth near Christina Lake in the Nelson Region.

DOUGLAS-FIR BEETLE
Dendroctonus pseudotsugae

Widely scattered mature Douglas-fir killed by Douglas-fir beetle were recorded over 19 000 ha in the Fraser River drainage between Clinton and Williams Lake. Tree mortality has fluctuated in the area since 1981. In 1982 and 1983 extensive trap tree programs were implemented to reduce beetle populations and tree mortality.

The number of recently attacked trees elsewhere in the province, estimated from aerial surveys, declined to a total of 325 trees singly or in small groups at widely scattered locations in the Nelson, Prince George and Vancouver regions.

WESTERN FALSE HEMLOCK LOOPER
Nepytia freemani

Infestations in Douglas-fir stands in the Shuswap Lake — Salmon Arm area of the Kamloops Forest Region declined significantly to 250 ha of mainly light defoliation, down from 1 150 ha in 1982. The cause of the decline in the third year of outbreak was the high incidence of a naturally occurring nuclear polyhedrosis virus. Nearly 75% of the early instar larvae were affected. At Scotch Creek near Chase another larval pathogen, *Entomophthora* sp., affected less than 5% of the population. Population surveys indicated a general decline for 1984 and the possible collapse of infestations in the Shuswap Lake - Salmon Arm area. After two successive years of defoliation, mature and intermediate age trees were killed on a rocky 25-ha site near Sunnybrae.

Scattered pockets of light defoliation totalled 110 ha near Invermere and Radium in the Nelson Region, the first outbreak since 1975. Egg surveys indicate very low populations and no visible defoliation in 1984.

ALPINE FIR PESTS

BUDWORMS
Choristoneura spp.

Infestations of two-year cycle and some one-year cycle budworm in alpine fir — spruce stands expanded to 165 000 ha from 90 000 ha in 1982, mainly in the Prince Rupert and Prince George regions with localized areas in the Nelson and Cariboo regions (See Map, Page 16).

Light to severe feeding on current and some older foliage by one- and two-year cycle forms was most extensive in the Prince Rupert Region with 85 000 ha in the Nass and Bell-Irving drainages, 37 000 ha in the Babine and Upper Skeena river valleys, and 30 000 ha in the Kispiox River Valley. Two outbreaks developed over 650 ha in Dahl and Mayo creeks near Terrace.

Mostly trace defoliation extended over 10 000 ha along

the Bowron River access road in the Prince George Region.

In the Nelson Region light to moderate defoliation occurred in 12 high-elevation stands totalling 2 000 ha. This was the first record of the budworm in seven areas in the West Kootenay.

New infestations were also recorded over approximately 200 ha southeast of Likely in the Cariboo Region.

Fall egg mass surveys in infestations near the Babine and Kispiox rivers indicate less intensive and extensive defoliation will occur in 1984. The pathogen, *Beauveria bassiana*, present in dead larvae and pupae on 40% to 100% (average 73%) of the trees sampled in eight areas in the Prince Rupert infestations may have contributed to the reduced number of egg masses in 1983.

Consecutive years of severe defoliation since at least 1979 has resulted in mortality of about 10% of the mature spruce over a total of 2 500 ha in the Bell-Irving, Kispiox, and White River valleys. Bud and twig mortality of understory fir and spruce regeneration is also widespread.

WESTERN BALSAM BARK BEETLE
Dryocoetes confusus

Regional estimates of mortality of mature alpine fir caused by the beetle with the associated fungus *Ceratocystis dryocoetidis*, totalled about 5 000 trees over 3 000 ha in 25 areas in the Cariboo, Kamloops, and Nelson regions. The apparent decline from 24 000 ha and 130 000 trees in 1982, was due mainly to reduced aerial survey coverage of previously active outbreaks, particularly of the Bulkley TSA in the Prince Rupert Region where 18 000 ha were affected in 1982.

HEMLOCK PESTS

WESTERN HEMLOCK LOOPER
Lambdina f. lugubrosa

Outbreaks in old growth western red cedar — western hemlock stands in the interior 'wet-belt' increased six-fold from 1982, to 37 250 ha. The most extensive were in the Nelson Region (See Map, Page 16) where 145 infestations from Mica to Lower Arrow Lake including four in Glacier and Mt. Revelstoke National Parks, covered 32 000 ha. Defoliation was light over 15 500 ha, moderate over 13 500 ha and severe over 3 000 ha. New infestations in the Kamloops Region covered 4,400 ha with mainly severe defoliation on 3 600 ha in the Shuswap Lake — Seymour River area. In the Prince George Region, 850 ha near the south end of Canoe Arm, north of Mica, were severely defoliated. High numbers of larvae, but no conspicuous defoliation occurred in the Quesnel Lakes area in the Cariboo Region after a two-year buildup.

Generally moderate defoliation with localized severe pockets will continue in 1984, but decline slightly from 1983 levels in most of the outbreak areas. The average number of viable eggs present in 100 gram lichen samples taken at three locations between Mica, Revelstoke and Lower Arrow Lake in the Nelson Region averaged 220, 192, and 56 per location, respectively. The incidence of egg parasitism, suspected to be caused by two wasps, *Trichogramma* sp. and *Telenomus* sp., as related to healthy eggs was 24, 28 and 34% per sampled location; a significant increase from less than 1% in 1982. This indicates a continuing but declining population, similar to the trend of the previous outbreak in 1974 which collapsed after egg parasitism reached 37% the previous fall.

Infestations in the Kamloops and Prince George regions are expected to be similarly affected.

TERMINAL CROOK DISEASE
Colletotrichum acutatum

Followup inspections of western hemlock seedlings in four sites near Northwest Bay on Vancouver Island,

for the introduced disease, were negative.

The pathogen was found for the first time in North America in 1982 on nursery stock in the Lower Mainland. Inspections will continue in 1984.

PHANTOM HEMLOCK LOOPER
Nepytia phantasmaria

Populations, which severely defoliated 100 ha of western hemlock forests around Coquitlam Lake in the Vancouver Region in 1982, collapsed in 1983; only two healthy larvae were collected. Two parasitic fungi, *Entomophthora* sp. and *Paecilomyces* sp., were prime factors in the collapse, infecting up to 80% of the 1982 prepupal larvae.

HEMLOCK SAWFLY
Neodiprion sp.

Following a significant population increase in parts of the Prince Rupert Region in 1982, understory and mature western hemlock were lightly defoliated in localized areas in Juno Creek in the Kispiox River and at Yakoun Lake and Alliford Bay on the Queen Charlotte Islands. Infestations are likely to continue on the Islands in 1984 which could result in some tree mortality.

LARCH PESTS

LARCH SAWFLY
Pristiphora erichsonii

The area of western larch defoliated in the second year of outbreak in the East Kootenay area of the Nelson Region, declined slightly to 10 400 ha from 12 000 ha in 1982. The decline occurred mainly in the Grave Lake area but the cause was not determined. The most extensive outbreaks were in the Sparwood and Fernie areas where over 40 infestations covered more than 5 000 ha of mainly light and moderate defoliation with small localized pockets of severe defoliation. Other infestations covered 2 500 ha from Fernie to north of Elko and more than 2 000 ha in the Dutch Creek area. Overwintering pupal numbers in duff samples from five areas indicate reduced populations in 1984.

LARCH CASEBEARER
Coleophora laricella

Populations increased significantly in western larch stands in the Cranbrook area of the Nelson Region. From previously static localized pockets in the Cranbrook and Jaffray areas, light to moderate defoliation expanded into the Elko, Baynes Lake, Gold Creek, and Kookanusa Lake areas. Populations in the West Kootenay and adjacent areas of the Kamloops Region remained at very low levels.

An introduced larval parasite, *Chrysocharis laricinellae*, which had been attributed in part to the decline of casebearer populations in the West Kootenay, was released in three casebearer infested stands in the Jaffray, Kookanusa Lake, and Slocan City areas as part of a continuing biological control program.

LARCH BUDMOTH
Zeiraphera improbana

New outbreaks covered 6 600 ha, of which 3 600 were lightly defoliated and 3 000 ha moderately defoliated, in 36 widely scattered western larch stands between 1 200 and 1 500 metres elevation in the Nelson Region. The largest infestations covered more than 4 300 ha in 14 areas in the West Kootenay in the Kettle and Granby river drainages and near Grand Forks. Smaller infestations were more numerous in the East Kootenay from near Skookumchuck and in the St. Mary's and

White river drainages.

It was the fourth outbreak in the province since the first was recorded in 1965, which covered more than 71 000 ha, mainly in the West Kootenay. The third outbreak collapsed after two years in 1979, when larval parasitism affected 50% of the population.

EUROPEAN LARCH CANKER
Lachnellula willkommii

This disease, which could have a significant impact on all age classes of western, alpine, and eastern larches, has not yet been collected in British Columbia. Two saprophytic fungi of the genus *Lachnellula* occur on western larch in British Columbia but do not affect tree growth.

MULTIPLE HOST PESTS

ROOT AND STEM ROTS

Root rots such as *Phellinus weirii*, *Armillaria mellea*, *Verticicladiella wageneri*, and *Polyporus tomentosus* cause widespread mortality in Douglas-fir, pine, and spruce stands throughout the province.

The root rot, *P. tomentosus*, widespread in conifers in North America, infected an average of 14% (range 0 to 22%) of the mature white spruce in 57% of 75 sites examined in the Prince Rupert Region. The highest incidence was in the Lower Bulkley River Valley where 22% of the trees were infected. An estimated 16% (13 to 20%) of the trees were infected in 14 areas in the Skeena, Babine, and Kitseguecla river drainages. Other root, heart, and sap rots such as *Polyporus schweinitzii*, *Haematostereum sanguinolentum*, and *Hirschioporus abietinus* infected single trees in eight locations. More than 80% of the root rot-infected sites had windthrown trees. These trees had attracted spruce bark beetle, *Dendroctonus rufipennis*, in 41% of the infected stands, and in 90% of 16 stands in the Kispiox, Morice, and Kitseguecla river drainages.

A root and butt rot, *Coniophora puteana*, often associated with basal scarring, severely infected 30% of the mature white spruce in pockets of about 2 ha in Congdon and Horseshoe Bay campgrounds in Kluane National Park, Yukon. Described as red ring rot, *Fomes pini*, in 1982 the disease necessitated the temporary closure of the areas and a hazard tree removal program.

Root rot surveys of more than 200 ha of Douglas-fir stands in the Quinsam area near Campbell River on Vancouver Island identified Phellinus root rot, *Phellinus weirii*, in about 7% (range 2 to 11%) of the area. The root disease was present in eight areas between 12 and 48 ha and infection centres ranged in size from single trees to 0.3 ha.

A root rot fungus, *Rhizina undulata*, associated with seedling mortality on recently burned sites, killed up to 35% of the Douglas-fir and white spruce seedlings in 1983 plantations surveyed by B.C. Ministry of Forests east of Horsefly in the Cariboo Region. The disease was present in two nearby sites but recently planted seedlings were not affected.

BLACK ARMY CUTWORM
Actebia fennica

Infestations severely defoliated or destroyed more than 200 000 seedlings in about 35 recently planted sites in the Prince Rupert and Prince George regions, a sixfold increase over 1982.

About 140 000 white spruce and lodgepole pine were affected in recently burned and planted sites in the Bristol Lake area in the Prince Rupert Region. Seedling mortality in plantations in the Chapman and Francois lakes areas ranged from 5 to 10%.

In the Prince George Region more than 30 plantations were affected by cutworms, up from 2 in 1982. More than 40 000 white spruce and lodgepole pine seedlings in a new plantation in the East Canoe area were severely damaged or killed. In the Takatoot area near Fort St.

James, an estimated 21 000 white spruce were severely defoliated in a 5-ha plantation and conifer seedlings and herbaceous ground cover were lightly defoliated in nine other plantations. Severe defoliation of newly planted white spruce occurred at Stony Lake south of Prince George and at Bill's Creek northeast of Bear Lake. Survival plots have been established in both areas.

Populations declined in recently planted areas in the North Thompson River drainage in the Kamloops Region. Light damage was limited to about 60% of the conifer seedlings in a 15-ha site near Adolph Creek, near where 32 000 seedlings were killed in 1982.

A high incidence of a nuclear polyhedrosis virus, the low number of pupae, and few male moths attracted to baited traps, indicate that populations may decline in 1984 in most of the areas sampled in the Prince George and Prince Rupert regions. A possible exception is at Francois Main where an average of 40 pupae per 1 000 cm^2 duff sample were found. Samples at Guess Creek, Bristol and Chapman lakes contained an average of 1 to 3 pupae, down from 16 in 1982. Pupae were not found at three other sample sites in the Prince Rupert Region. The virus infected at least 85% of larvae collected from six infestations in the Prince George Region. A high incidence of pupal predation by unidentified rodents significantly reduced populations in the Purden Lake area near Prince George. More than 130 baited traps, the majority in 16 recently burned areas of the Prince Rupert Region, attracted an average of less than one adult per trap (range 0 to 5) down from 5 to 34 in 1982. The significance of the numbers per trap beyond identifying the pest's presence is being calibrated and the pheromone chemistry is being studied.

PESTS IN YOUNG STANDS

Post-operational surveys for forest pests in 34 forestry-related Employment Bridging Assistance Programs (E.B.A.P.) throughout the province were completed in cooperation with the Forestry Development and Relations Group, (Table 4). Most programs involved juvenile spacing but included control of localized mountain pine beetle and spruce beetle infestations in the Nelson Region; dwarf mistletoe control in the Cariboo and Prince George regions and pruning of blister rust-infected white pine trees in the Nelson Region and on Vancouver Island.

Dwarf mistletoe persisted in two treated lodgepole pine stands in the Cariboo Region and mistletoe plant growth was enhanced by spacing in infected western hemlock stands along the Kalum Road in the Prince Rupert Region. Single spruce trees were infected by the root rot *Armillaria mellea* in association with the root collar weevil *Hylobius* sp. in Natlin Creek in the Prince Rupert Region. The disease also infected about 5% of the Douglas-fir in three spaced stands in Cariboo and Nelson regions.

TABLE 4. Pests in Employment Bridging Assistance Program sites, British Columbia, 1983.

Forest Region	Number of Projects and Tree Species	Pest(s) present
Cariboo	4 lP, D-fir	Engraver beetles Pine terminal weevil
Kamloops	5 lP	Branch rust, needle cast, rodents
Nelson	9 Mixed	Engraver beetles, root rot, mechanical damage
Prince George	2 lP	Stem and branch rusts
Prince Rupert	7 Mixed	Root rot, root & collar weevil Spruce weevil, mechanical damage
Vancouver	7 D-fir, wwP, wH	Stem rust

Current and potential pest conditions were also assessed in 44 sites which were 'Not Sufficiently Restocked' (N.S.R.) in 1983 since being logged prior to 1979. The examinations were initiated to address the backlog of reforestation in British Columbia under potential federally supported programs. Brush competition severely affected 90% of the sites, and deer browsing of deciduous ground cover occurred in 17 areas in the Kamloops and Nelson regions and on Vancouver Island.

Potentially damaging pests of seedlings planted in treated N.S.R. sites include, black army cutworm, *Actebia fennica*, a seedling weevil, *Steremnius carinatus*, and Rhizina root rot, *Rhizina undulata*.

A SEEDLING WEEVIL
Steremnius carinatus

Mortality of recently planted conifer seedlings increased significantly in the third year of infestation near Holberg on Vancouver Island. In surveys by industry, an average of 6% (range 2 to 12%) of the seedlings were killed in 17 of 30 sites including 12% (0-21%) of the amabilis fir in six areas, and 10% (0-33%) of the western hemlock in 18 areas. Seedling mortality in four plantations surveyed later in the year was 7% of the amabilis fir, and 1% of the western hemlock. Severe basal girdling by the weevil affected between 17 to 50% (average 29%) of the amabilis fir, 18% (range 16-31%) of the western hemlock, and 5% (range 0-11%) of the Sitka spruce, and affected an average 20% (range 13-33%) of all the seedlings in the four plantations.

WESTERN GALL RUST
Endocronartium harknessii

The rust infected an average of 8% of the 1 350 13-year old lodgepole pine in 16 spaced plots and 7% of 377 trees in eight nonspaced plots in a fertilizer-spacing trial area west of Spillimacheen in the Nelson Region. The rust-induced galls were predominantly on the stems and frequently on the butt area. This would indicate that the trees were infected in the first few years of growth. Some infections were apparently removed by the thinnings as stem infections were more common in nonspaced plots (77%) than in spaced plots (57%). Branch infections were also more numerous in nonspaced plots (43% of infected trees) than in spaced plots (23% of infected trees).

RODENTS

Debarking of immature lodgepole pine by rodents, such as snowshoe hare and squirrels, was assessed also in the spaced and fertilized trial area west of Spillimacheen in the Nelson Region. An average of 26% (range 11 to 48%) of the trees in spaced plots had patches of bark removed from stems and branches prior to 1983, compared to 7% of the trees in nonspaced plots. In 1983 the incidence of debarking declined to about 6% in the spaced plots and 1.5% in the nonspaced plots. Only 3% (48) of the trees in 24 plots were dead, of which 9% (13) were infected by western gall rust stem infection. None were killed by rodent debarking.

A similar incidence of debarking occurred in a 5-ha, 10-year-old rust-infected lodgepole pine plantation near Vanderhoof.

Porcupine feeding killed numerous 30 year-old western hemlock, and some immature Sitka spruce at two sites, totalling 1 400 ha in Khutzeymateen Inlet north of Prince Rupert, and near Stewart. Mortality of immature western hemlock in these and other areas has been estimated periodically since 1976, at up to 20%.

CONE AND SEED PESTS

Cone crops for most species were generally moderate with areas of heavy production in Douglas-fir stands in the interior and on southern Vancouver Island.

Cone and seed pests affected an average of 38% (range 10 to 100%) of the Douglas-fir cones and 33% (range 0 to 96%) of the spruce cones in 48 stands in the Kamloops, Nelson, and Prince Rupert regions, on Vancouver Island, and in parts of the Yukon (Table 5).

In 27 spruce stands in three regions cone seedworms, *Cydia* spp., and, to a lesser degree, a spruce cone maggot, *Hylemya* sp., infested 20% (range 4 to 49%) of the cones. Spruce cone rust, *Chrysomyxa pirolata*, infected less than 5% of the crop in coastal areas in the Prince Rupert Region and black spruce cones from Dawson City, Yukon, were pest-free.

Nearly 38% (range 25 to 50%) of the Douglas-fir cones were infested in 21 areas, mainly in the Nelson Region. A cone moth, *Barbara colfaxiana*, affected up to 32% of the cones in 16 stands in the Kamloops and Nelson regions and five in Vancouver Island. Cone midges and seed chalcids infested up to 20% of the cones in coastal and interior stands.

An important blight of spruce and pine seedlings, *Sirococcus strobilinus*, frequently prevalent on container stock, was found in the fruiting stage on old spruce cones in three areas in the Prince Rupert Region and three in the Nelson Region. The collections helped to clarify the disease cycle.

TABLE 5. Location and incidence of cone and seed pests in British Columbia, 1983

Location by Forest Region	Host	No. of Stands Examined	Percent of Cones Infested by all Pests		Average Percent of Infested Cones by Pest	
			Average	Range		
Kamloops	D-fir	3	25	15-35	*Barbara colfaxiana*	18
					Dioryctria abietivorella	8
					Contarinia oregonensis	5
	eS	3	33	0-65	*Hylemya* spp.	18
					Cydia sp.	8
					Dasineura rachiphaga	8
Nelson	D-fir	13	40	11-85	*B. colfaxiana*	31
					C. oregonensis	20
					D. abietivorella	19
					C. washingtonensis	7
	eS	2	21	-	*Hylemya* spp.	10
Prince Rupert	wS	7	67	43-96	*Hylemya* spp.	49 wS, 31 sS
	sS	3	31	5-55	*C. youngana*	21 wS, 11 sS
					Chrysomyxa rust	3 wS, 4 sS
Vancouver	D-fir	5	50	10-100	*B. colfaxiana*	32
					C. oregonensis	19
					Megastigmus spermotrophus	12
					D. abietivorella	5
					C. washingtonensis	3
Yukon	wS	4	15	0-65	*C. youngana*	18
	bS	1	1+		*H. anthracina*	5
TOTAL		48				

DECIDUOUS AND ORNAMENTAL TREE PESTS

GYPSY MOTH
Lymantria dispar

The first recorded incidence of the moth on Vancouver Island occurred in late 1983 with nine male adults identified in four pheromone-baited traps in Courtenay. The insect was recorded on the Lower Mainland in 1976, 1982 and again this year, however populations have not become established nor defoliation recorded to date. None were found in 106 traps in 83 forested recreational parks throughout the province, monitored by the Forest Insect and Disease Survey. Egg mass surveys in the Courtenay area, in cooperation with Agriculture Canada, were negative, but three egg masses were found in the Langley area in the Vancouver Region where 26 moths were collected in 18 traps. A destructive feeder on most hardwoods and, to a lesser degree, on conifers. Its potential (eight million ha defoliated in northeastern North America in 1982) could have a severe impact on industries including fruit growing. Possible quarantine restrictions remain more of a concern than the threat of defoliation at this time. The cooperative Agriculture Canada/CFS-FIDS program of pheromone trapping, and egg mass survey when required, will continue in 1984.

FOREST TENT CATERPILLAR
Malacosoma disstria

Populations of one of the major defoliators of deciduous trees in the interior of British Columbia increased significantly in the Cariboo, Prince George and Prince Rupert regions.

Defoliation of willow and black cottonwood was severe in the Prince Rupert Region and in localized pockets in the Hazelton and Kispiox River Valley areas and Dahl Creek north of Kitimat. Egg surveys in the Region indicate a rapidly increasing population in 1984.

Severe defoliation of trembling aspen was extensive in the Salmon River Valley north of Prince George and light in localized 2- to 5-ha groves in the Peace River area of the Prince George Region.

Moderate defoliation of the upper crowns of birch stands between 1 and 100 ha was common in the Quesnel River Valley and in the Horsefly and Likely areas in the Cariboo Region.

SATIN MOTH
Leucoma salicis

Localized populations severely defoliated trembling aspen and black cottonwood groves in parts of the Kamloops and Nelson regions for the first time since 1977.

A 5-ha black cottonwood grove in the Moyie townsite in the Nelson Region was totally defoliated. This was only the second incidence of the defoliator in the East Kootenay since it was first found in the Region, near Needles in 1963.

Moderately to severely defoliated black cottonwood and trembling aspen in 1- to 5-ha groves were widespread in the Kamloops Region from Carpenter Lake west of Lillooet in the Tulameen area, near Hedley, and near Rock Creek in the Nelson Region.

BIRCH LEAF MINER
Lyonetia saliciella

Discoloration of western birch foliage by the leaf miner, previously attributed to the miner, *Bucculatrix canadensisella*, was moderate to severe in the Kamloops, Nelson, and Prince George regions. Two- to 20-ha patches were common in widespread areas including: from Louis Creek to Albreda in the North Thompson River Valley in the Kamloops Region; from Bugaboo Creek to Glacier and Yoho National Parks in the Nelson Region; in the McBride and Vale-

mount areas in the Prince George Region. Many of the affected trees in the Barriere, Clearwater, Vavenby, and Albreda areas in the North Thompson River Valley refoliated by late summer.

WESTERN OAK LOOPER
Lambdina f. somniaria

For the fourth consecutive year Garry oak in a 16-ha ecological reserve on Saltspring Island were lightly defoliated. Defoliation declined about 20% resulting in the recovery of most previously severely defoliated trees. However, Douglas-fir bark beetle remains a threat to previously defoliated Douglas-fir, many of which in adjacent stands are infected by red ring rot, *Fomes pini*. High numbers of healthy mature larvae evident in mid-August indicate populations will continue in 1984.

WINTER MOTH
Operophtera brumata

Widespread moderate to severe defoliation of deciduous trees and shrubs, mainly Garry oak, continued for about the thirteenth consecutive year in the Greater Victoria area, Saanich Peninsula, and Western Communities. Defoliation was recorded for the first time in the Duncan area where a small number of fruit trees were lightly defoliated, but it remains absent from the Lower Mainland, Fraser Valley, and Gulf Islands areas.

Although the introduced larval parasites, *Agrypon flavolatum* and *Cyzenis albicans*, released during 1979-82, were visible in early May, they do not yet appear to be established in sufficient numbers to have affected the winter moth populations.

DOGWOOD LEAF BLOTCH (ANTHRACNOSE)
Gloeosporium spp.

An increased incidence of infection by this pathogen occurred in the Vancouver Region. The lower one-third of the crown of single trees and groups of 5 to 20 were moderately to severely (up to 85%) infected in four locations along the east coastal region of Vancouver Island from the Saanich Peninsula to Nanaimo and on Gabriola Island. Similar infection levels occurred on the Mainland from Peace Arch Park east to Agassiz, and north to near Powell River. Infected leaves commonly drop prematurely and twig infections may result in dieback and leaf bud mortality.

CYPRESS TIP MOTH
Argyresthia sp.

Populations increased substantially in 1983 and severely discolored and killed new branch tips of ornamental cypress trees and shrubs in the Greater Victoria, Duncan, and Nanaimo areas. Native conifers were not affected. Common in southwestern B.C., its overwintering survival rate may have been enhanced by the mild 1982-83 winter.